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# After Action Report - CUP-2 Comparative Sample Analysis Meeting - Kazakhstan September 2016

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October 4, 2016

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**AFTER ACTION REPORT**  
CUP-2 Joint Sample Analysis LLNL/INP/JAEA  
Discussion of Results and Follow-up Actions  
LLNL-TR-704284

Kazakhstan September 2016

**US TEAM:**

Kaitlin Oujo	Nuclear Smuggling Detection and Deterrence, National Nuclear Security Administration (DOE/NNSA/NSDD NA-213)
Gary Eppich	Lawrence Livermore National Laboratory (LLNL)
Rachel Lindvall	Lawrence Livermore National Laboratory (LLNL)
Ruth Kips	Lawrence Livermore National Laboratory (LLNL)
Bill Geist	Los Alamos National Laboratory (LANL)

**DESTINATION:** *Almaty - Kazakhstan*  
**DATES:** *10-17 September 2016*



**Fig. 1:** Rachel Lindvall (LLNL) discussing ICP-MS results at the joint CUP-2 UOC meeting at INP.

**PURPOSE/SUMMARY:**

Representatives from the U.S. Department of Energy’s Office of Nuclear Smuggling Detection and Deterrence (NSDD) visited the Kazakhstan Institute of Nuclear Physics (INP) to discuss the results and conclusions of a joint sample analysis (CUP-2 uranium ore concentrate) between LLNL, INP and the Japan Atomic Energy Agency (JAEA) (Fig. 1). The U.S. delegation also met with the newly-appointed Director-General of the INP (S. Sakhiyev) who expressed his continued support for this collaboration. On the last day of the visit, the delegation toured the new medical isotope production facilities (which is expected to begin operation in a few months), as well as INP’s Nuclear Security Training Center (co-funded by

DOE, the Defense Threat Reduction Initiative (DTRA) and the Kazakhstan government). Construction of the Nuclear Security Training Center is expected to be completed by the end of 2016.

## TIMELINE

<b>Day</b>	<b>Activity</b>
Saturday 10 September 2016	Departure US
Monday 12 September 2015	Arrival hotel Almaty, Kazakhstan
Tuesday 13 September 2016	1 <sup>st</sup> day of discussions of CUP-2 results
Wednesday 14 September 2016	2 <sup>nd</sup> day of discussions of CUP-2 results
Thursday 15 September 2016	Finalization CUP-2 results + lab tour
Friday 16 September 2016	Discussion on follow-up training + visit Nuclear Security Training Center site
Saturday 17 September 2016	Return to U.S.

## MEETING LOCATION AND BACKGROUND

The meeting was held at the Institute of Nuclear Physics (INP) of the Republic of Kazakhstan in Almaty, 13-16 September 2016. INP is a part of the National Nuclear Center of the Republic of Kazakhstan, under the Ministry of Energy. The Institute was established in 1957 and houses a 6MW light water-moderated VVR research reactor. INP's primary function is to conduct research in the field of nuclear and solid-state physics, as well as nuclear technology development, reactor safety research, radiation materials studies, and the monitoring of environmental radiation levels in Kazakhstan (including the Semipalatinsk and other sites in Western Kazakhstan). INP also recently made major investments into its isotope production facilities (including a new cyclotron and several hot cells) for medical and industrial use. A visit of the environmental and nuclear materials research laboratory spaces, the cyclotron (IBA), and the new isotope production facility (under preliminary testing and just starting experimental operations) were provided to the U.S. and Japan delegation. Delegates from the United States and Japan were provided with a visit to the environmental and nuclear materials research laboratory spaces, the cyclotron (IBA), and the new isotope production facility (which is under preliminary testing, and just starting experimental operations).

INP is one of the primary laboratories in Kazakhstan supporting the analysis of nuclear materials found outside of regulatory control. Under the auspices of the 2006 Joint Communiqué on counter trafficking of nuclear and radioactive material, DOE/NSDD is cooperating with INP on strengthening Kazakhstan's nuclear forensics capabilities. In September 2014, Kazakhstan accepted the following proposal for collaboration between NNSA and INP in the area of technical nuclear forensics:

- As the first step of the cooperation plan, three technical experts from INP attended the **IAEA-NNSA International Training Course on Nuclear Forensics** Methodologies, held at PNNL, in May 2015.

- As a continuation, a scenario-based workshop for technical staff detailing considerations for ‘**Analytical Plan Development in Support of Nuclear Forensics Investigations**’ was created by subject matter experts from LLNL and LANL. The pilot version of this workshop was delivered at INP in July 2015.
- At the 2016 Nuclear Security Summit, the United States and Kazakhstan made a joint announcement highlighting a set of concrete measures undertaken by the two countries for enhancing security of nuclear materials storage, as well as reconfirming their commitment to continuing practical collaboration in the field of nuclear security.
- The “Analytical Plan Development” workshop provided the appropriate context and background to prepare INP for the next step in the NNSA/INP collaboration - the **joint INP/LLNL/ JAEA comparative sample analysis** of a commercially available uranium ore concentrate (UOC) certified material (CUP-2, Natural Resources Canada) reported here.

## MEETING ON JOINT CUP-2 URANIUM ORE CONCENTRATE ANALYSIS

### Workshop Discussions

The purpose of the meeting was to: consolidate and discuss analytical results on the joint analysis of uranium ore concentrate (UOC) (and CUP-2 UOC in particular); share best practices for obtaining, interpreting and reporting data; as well as to formulate conclusions and recommendations in order to advance technical and analytical skills relevant to nuclear forensic analyses. The agenda for the meeting can be found in Attachment A.

CUP-2 UOC is particularly useful for this initial sample exchange/joint analysis because:



- Kazakhstan is a **major producer of uranium ore concentrate** and this type of material is of interest to the INP from a technological, industrial and nuclear forensics perspective.
- CUP-2 is a **commercially available** natural uranium product (CUP-2, Natural Resources Canada) and is relatively easy to ship (more information on the material in Attachment D).
- CUP-2 has a **relatively high level of impurities**, which makes it interesting to compare trace elemental concentrations.
- **LLNL has several years of experience analyzing CUP-2** and uses the material as a control sample to track precision over time. The amount of data generated at LLNL in order to participate in this joint sample analysis was therefore limited.
- Even though CUP-2 is widely used, **very little has been published on the characterization of this material.**

**Fig. 2:** A 25g bottle of CUP-2 UOC.

For this joint sample analysis, LLNL shipped a glass jar of 25g (Fig. 2) and an aliquot of approximately 1g of CUP-2 uranium ore concentrate to INP and JAEA respectively. The amount for JAEA was limited to 1g (per JAEA’s request) because of limitations in the amount of nuclear material that can be received/handled in JAEA facilities. Otherwise, the laboratories were not sample limited for their analyses. After receipt of the sample at INP and

JAEA, measurements were completed within a four to six months' timeframe. Each institute/laboratory was encouraged to provide information (listed in Attachment C) on the instrument type, the sample preparation, the uncertainty calculations and calibration practices, in addition to reporting on the results.

Some general remarks about the analyses:

- The analyses were performed in analytical laboratories with decades of experience in the techniques that were applied to the UOC sample.
- For most laboratories, nuclear forensic analyses are only a small portion of the type of analyses performed in these facilities, underscoring the sustainability of this project.
- All laboratories developed and documented an analytical plan that outlined the sequence of techniques to be applied to the sample, in accordance with the messaging from the Analytical Plan Development Workshop delivered at INP in July 2015.
- SOPs and other procedures were followed for an actual nuclear forensics 'case' sample – starting with documenting sample receipt, performing dose rate measurements, followed by short-term measurements and destructive analyses.
- For all laboratories, the analysis results were presented by SMEs for the different techniques at the three participating laboratories. Sufficient time was built into the agenda for discussion.

## RESULTS AND CONCLUSIONS

The results of the analyses and the findings that resulted from the discussions during this meeting will be presented in a joint poster contribution to the IAEA's *Nuclear Security International Conference on Nuclear Security: Commitments and Actions*, which will take place in Vienna in December 2016. In addition to this poster, a joint LLNL/INP/JAEA manuscript will be prepared for publication in a peer-reviewed international scientific journal. These are some of the main conclusions and recommendations that will be highlighted in the poster/publication:

- Each of the laboratories took a very thorough approach to the receipt, handing and characterization of the uranium ore concentrate material, using a well-designed analytical plan.
- Discussions on the different analytical results showed the need for standardization of certain methods (for example: conditions in which the sample color was determined, uranium content variations possibly due to differences in moisture uptake).
- The results of the three laboratories were generally in agreement, although the analytical approach varied between the labs and often resulted in variations in the measurement precision and accuracy.
- Areas for more advanced scientific exchanges and on-the-job training were identified to further advance technical and analytical skills relevant to nuclear forensic analyses.

## NEXT STEPS

On the final day of the meeting, the group summarized the conclusions obtained by different analytical techniques. This was followed by a discussion on action items and immediate next steps:

- LLNL will draft a final report to cover the results of the meeting and lessons learned.
- LLNL will initiate the drafting of a poster to be submitted to the IAEA's Nuclear Security Conference in December, and will submit the draft to INP and JAEA for comments.
- DOE/NNSA will designate appropriate resources for follow-on activities.

Areas for more advanced scientific exchange and on-the-job training for INP were identified and discussed. In particular, INP can further advance in the following nuclear forensics analytical skills:

- Gamma spectrometry
- Inductively coupled plasma mass spectrometry
- Radiochronometry
- Nuclear forensics library development

A tentative timeline for these follow-on activities was agreed upon between DOE/NNSA, INP, LLNL and LANL (see Section 'Next Steps').

INP also reached out to LLNL to restart collaboration on the joint analysis of a set of UOC samples collected from different mines within Kazakhstan (continuation of project on '*Collection of Uranium Ore Concentrate Samples*'). The samples for this project were shipped by KazAtomProm to LLNL several years ago, but INP never received the same aliquots from KazAtomProm and is now looking at options to still obtain the samples. This is an appropriate next step in the joint characterization of UOC samples and could be an excellent opportunity to assess INP's capabilities in measuring low impurity UOC materials. The results from these measurements could also be used in INP's nuclear material library/database (to be developed).

Finally, the United States/Japan delegation met with the newly-appointed Director-General of the Institute, who showed great interest in the comparative sample analysis and expressed his continued support for continued collaboration and scientific engagements.

## Workshop Participants

A total of seventeen scientists and managers participated in the meeting. The full list of participants is attached (Attachment B).

**INP** - The lead participant for INP was Viktor Gluschenko, Head of the Center of Complex Ecological Research, who acted as the point of contact for the joint sample analysis and who also coordinated the analysis and reporting for INP. He was joined by his scientific staff, who participated in the different aspects of the analysis. The Deputy Director-General (Petr Chakrov) attended the first and last day of the meeting, while the Advisor to the General Director (Alexandr Pustovoy) and the Head of the Radiation Safety Department (Sergey Sidorenko) were present for the entire duration of the meeting.

**JAEA** – Ayako Okubo represented the Japan Atomic Energy Agency.

**U.S. DOE** – Kaitlin Oujo (NSDD) was the HQ Lead for this engagement. Scientific staff from both the nuclear forensics group at LLNL and LANL participated in the meeting. Ruth Kips is the LLNL lead for nuclear forensics engagements with Kazakhstan, and is also an SME in sample preparation and electron microscopy. Rachel Lindvall is the LLNL expert for ICP-MS trace element analysis, while Gary Eppich’s expertise is in isotope ratio measurements by ICP-MS and X-ray analysis techniques. Rachel Lindvall will be coordinating follow-up training on ICP-MS (planned for March-April 2017).

Although LANL did not participate in the CUP-2 UOC analysis, Bill Geist (LANL) has years of experience in training international audiences on gamma and neutron detection for nuclear safeguards and nuclear forensics. He therefore presented LLNL’s gamma spectrometry data and participated in the discussions on follow-up training in gamma spectrometry at LANL (planned for early 2017).



**Fig. 3:** Participants from JAEA (left), U.S. DOE and INP (center) at the CUP-2 analysis meeting at INP.

**KEY CONTACTS:**

<b>Name</b>	<b>Title/Contact Info</b>
Chakrov, Petr	Deputy General Director of the Institute for Nuclear Physics/ <a href="mailto:chakrov@inp.kz">chakrov@inp.kz</a> , +7-727-386-6801
Gluchshenko, Viktor	Head of Center of Complex Ecological Investigations, Institute for Nuclear Physics/ <a href="mailto:vik@inp.kz">vik@inp.kz</a> , +7-727-386-6843
Sakhiyev, Sayabek	General Director of the Institute for Nuclear Physics

**KEY ISSUES AND OBSERVATIONS:**

- Each of the laboratories took **a very thorough approach** to the receipt, handing and characterization of the uranium ore concentrate material, using a well-designed analytical plan.

- The results of the three laboratories were generally in agreement, although the analytical approaches varied between the labs and often resulted in variations in the measurement precision and accuracy. Upon review it was determined that the differences in the dissolution techniques were the main contributors to the differences seen in the analytical results between the three laboratories.
- INP has very limited capability to purchase uranium standards. Making the appropriate calibration standards available would improve results and deepen sample characterization (i.e. reporting on uranium minor isotopes).
- Findings, conclusions, and recommendations on the joint analysis of CUP-2 UOC will be summarized in a poster for the IAEA's International Conference on Nuclear Security: Commitments and Actions, and described in detail in a joint peer-reviewed scientific publication.
- **Areas for more advanced scientific exchanges and on-the-job training** were identified to further advance the analytical skills relevant to nuclear forensic analyses:
  - Both INP and JAEA demonstrated that they are very advanced in the use of the different analytical techniques. Future training efforts will, therefore, be directed towards the application of these techniques in the context of a nuclear forensics sample and the specific analytical challenges associated with these samples.
  - Areas for follow-on collaborations/training that were identified: gamma spectrometry, inductively coupled plasma mass spectrometry (ICP-MS)
  - In addition to the techniques listed above, INP expressed explicit interest in radiochronometry and the development of a national nuclear forensics library (NNFL). A module on NNFL development will be included in the Technical Exchange on ICP-MS at LLNL in April 2017 as an introduction to the NNFL workshop which is planned for the fall of 2017. The more advanced isotope ratio mass spectrometric analyses that are required for radiochronometry may be included as part of the work plan for FY18.
  - INP also expressed interest in demonstrating the importance of 'chain-of-custody' and the overall process of nuclear forensics when training their technical staff.
- **INP confirmed their participation in the next Collaborative Materials Exercise (CMX-5)** organized by the Nuclear Forensics International Technical Working Group (ITWG) starting in the fall of 2016.
- INP expressed interest in a **joint INP/LLNL analysis of a set of UOC samples** provided by KazAtomProm.
- **Meeting with INP Director General** confirmed high-level support from Kazakhstan for continued scientific collaborations.

### **NEXT STEPS:**

The next step will be for NSDD/LLNL to work with INP on:

- Documenting key findings and recommendations from joint INP/LLNL/JAEA CUP-2 UOC analysis in **poster and scientific publication**. The poster will be presented at the IAEA's International Conference on Nuclear Security: Commitments and Actions.
- **1-week hands-on training at LLNL on the application of inductively coupled plasma mass spectrometry (ICP-MS)** and related techniques for nuclear forensics samples with select technical experts from INP – *tentatively scheduled for March/April 2017*.
- **Hands-on training at LANL on the application of FRAM/MGA(U) software for gamma spectrometry** for a different, slightly larger group of INP experts. INP indicated they will receive the FRAM software at their institute within the next few months, which will allow them to become more familiar with the software before attending the training course at LANL – *tentatively scheduled for February 2017*.
- **National Nuclear Forensics Libraries (NNFL) Workshop at INP** *tentatively scheduled for fall 2017*.

### **IMPACT ON COUNTRY PLANNING:**

- The discussions on the analytical approach and the lessons learned from the analysis of a uranium ore concentrate sample allowed NSDD to identify follow-on training opportunities which will further advance NSDD's goal of strengthening the nuclear forensics capacity in Kazakhstan.
- DOE/NNSA's program will proceed according to the proposal on technical nuclear forensics cooperation that was accepted by Kazakhstan during the official government-to-government Counter Nuclear Smuggling Implementation Review on November 8-9, 2014.

### **Attachments:**

- A. Meeting agenda
- B. Participants list
- C. CUP-2 UOC Analysis List of Applied Techniques
- D. CUP-2 UOC Certificate, Natural Resources Canada
- E. Update on the Status of the Nuclear Security Training Center at INP

**Attachment A: Workshop agenda**

**INP/LLNL/JAEA Comparative Sample Analysis  
on CUP-2 Uranium Ore Concentrate**

Agenda for Review Meeting 13-16 September 2016, INP Almaty

**Tuesday 13 September 2016**

8:30 Start of the meeting + welcome by Dr. Petr Chakrov/Viktor Gluchshenko (INP)

8:45 Introductions

9:15 Discussion analysis results:

- Visual inspection
- Weighing
- Optical microscopy
- Pycnometry

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10:30 Break

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10:45 Discussion analysis results:

- Scanning Electron Microscopy (SEM)
- Energy-dispersive X-ray Analysis
- Transmission Electron Microscopy (TEM)

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12:15 Lunch

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13:30 Discussion analysis results:

- Dosimetry
- Alpha spectroscopy
- Beta spectroscopy
- Gamma spectrometry

16:45 End of day 1

**INP/LLNL/JAEA Comparative Sample Analysis  
on CUP-2 Uranium Ore Concentrate**

**Wednesday 14 September 2016**

8:30 Start of second day - Recap/review

9:00 Discussion analysis results:

- X-ray Fluorescence (XRF)
- X-ray Diffraction (XRD)

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10:45 Break

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11:00 Discussion analysis results:

- Davies-Gray
- Elemental composition by ICP-MS
- Elemental composition by ICP-OES

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12:15 Lunch

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13:30 Discussion analysis results (continued):

- Davies-Gray
- Elemental composition by ICP-MS
- Elemental composition by ICP-OES

16:15 End of day 2

**INP/LLNL/JAEA Comparative Sample Analysis  
on CUP-2 Uranium Ore Concentrate**

**Thursday 15 September 2016**

8:30 Start of third day – recap/review previous days

9:00 Discussion analysis results:  
- Uranium isotopic composition by ICP-MS

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12:15 Lunch

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13:30 Discussion analysis results (continued):  
- Uranium isotopic composition by ICP-MS

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14:45 Break

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15:00 Discussion: ICP-MS and gamma spectrometry training at LLNL/LANL

16:30 End of day 3

**Friday 16 September 2016**

8:30 Start of last day of the meetings – recap/review previous days

9:00 Discussion:  
- Next steps in the engagement:  
Future opportunities for joint sample analysis and training opportunities  
- Joint Publication – Presentation at IAEA Nuclear Security Meeting in December 2016

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12:15 Lunch

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13:30 Lab tour

15:30 End of visit

**Attachment B: Workshop participants list**

<b>№</b>	<b>Full name</b>	<b>Institute</b>	<b>Position</b>	<b>Contribution to CUP-2 analysis</b>
1	Gluchshenko Viktor	INP	Head of Center of Complex Ecological Research in INP	Coordinator of sample analysis for INP
2	Sidorenko Sergey	INP	Head of Radiation Safety Department in INP	Primary inspection, dosimetry and radiometric measurements
3	Pustovoy Alexandr	INP	Advisor of General Director, INP	Coordination of expert forensics activities at INP, preparation of forensics conclusions
4	Kim Dmitriy	INP	Deputy Chief of Radiation Safety Department	Primary inspection, dosimetry and radiometric measurements
5	Sidorenko Konstantin	INP	Head of Radiation Control Department	Primary inspection, dosimetry and radiometric measurements
6	Kharkin Pavel	INP	Production Chief Specialist, Center of Complex Ecological Research	Organization of laboratory analyses
7	Zheltoy Dmitriy	INP	Senior staff scientist	Elemental and trace elemental composition by ICP-MS
8	Edomskaya Mariya	INP	Junior staff scientist	Elemental and trace elemental composition by ICP-MS
9	Gluchshenko Galina	INP	Head of spectrometry group	Radionuclide composition (alpha – beta- spectrometry)
10	Baigurzhin Aidos	INP	Engineer	Gamma-spectrometry
11	Abdurahmanov Zhasulan	INP	Engineer	Gamma-spectrometry
12	Ayako Okubo	IAEA	Integrated Support Center for Nuclear Nonproliferation and Nuclear Security	Coordinator of sample analysis for IAEA
13	Kaitlin Oujo	NSDD	Country Manager	Coordinator for NSDD HQ
14	Gary Eppich	LLNL	SME	XRF, Davies-Gray, Optical, Isotope ratio by ICP-MS
15	Rachel Lindvall	LLNL	SME	Trace elements by ICP-MS
16	Ruth Kips	LLNL	SME, Nuclear Forensics Lead Kazakhstan	Coordinator for Joint Sample Analysis
17	Bill Geist	LANL	SME	Gamma spectrometry training specialist

**Attachment C: CUP-2 UOC Analysis List of Applied Techniques**

Analytical Technique	Laboratory			Type of data
	INP	JAEA	LLNL	
Visual Inspection	x	x	x	Macroscopic features, color
Weighing	x	x	x	Sample mass
Optical microscopy	x	x	x	Grain size, morphology
Dosimetry	x	x	x	Dose rate, gamma, beta and alpha activity
Scanning Electron Microscopy (SEM)	x	x	x	Grain size, morphology
Transmission Electron Microscopy (TEM)		x		Grain size, morphology
Energy-dispersive X-ray Analysis	x	x	x	Elemental composition
Gamma-spectrometry	x	x	x	Uranium isotopic ratios
Alpha-spectroscopy	x			Uranium and Plutonium isotopic ratios
Beta-spectroscopy	x			Determination Sr-90
X-ray Fluorescence (XRF)	x		x	Semi-quantitative major element composition
X-ray Diffraction (XRD)			x	Crystallography/composition
Davies-Gray Titration			x	Uranium concentration
Elemental composition by Inductively-Coupled Plasma Mass Spectrometry (ICP-MS)	x	x	x	Major and trace element concentrations
Elemental composition by Inductively-Coupled Optical Emission Spectrometry (ICP-OES)	x			Major and trace element concentrations
Uranium isotopic composition by Inductively-Coupled Plasma Mass Spectrometry (ICP-MS)	x	x	x	Uranium isotopic ratios

**Attachment D: CUP-2 UOC Certificate**



**CCRMP**  
Canadian Certified Reference Materials Project

CANMET Mining and Mineral Sciences Laboratories  
555 Booth Street, Ottawa, Canada K1A 0G1

Tel.: (613) 995-4738, Fax: (613) 943-0573  
E-mail: ccrmp@nrcan.gc.ca  
www.ccrmp.ca

**PCMRC**  
Projet canadien de matériaux de référence certifiés

Laboratoires des mines et sciences minérales de CANMET  
555, rue Booth, Ottawa, Canada K1A 0G1

Tél. : (613) 995-4738, Téléc. : (613) 943-0573  
Courriel : pcmrj@nrcan.gc.ca  
www.ccrmp.ca

# Certificate of Analysis

## Certified Uranium Ore Concentrate CUP-2

**Certified Value**

U, mass %	75.42
<b>95% Confidence limits</b>	
Low	75.25
High	75.59

**Description**

CUP-2 is a uranium ore concentrate reference material produced as joint effort between CCRMP and the Analytical Subcommittee of the Canadian Uranium Producers Metallurgical Committee.

The material was received from the Blind River refinery of Eldorado Resources Ltd. in the summer of 1986. It was blended, checked for homogeneity by X-ray fluorescence analysis, bottled in 25-g units and distributed for analysis.

**Certification Project**

CUP-2 was characterized by an interlaboratory analysis program. Eight member laboratories of the Analytical Subcommittee, six commercial laboratories, and three additional volunteer laboratories participated in the project by

providing five replicate results on up to 17 analytes. Uranium was reported on a dry basis; all others were determined on an "as received" basis.

**Recommended Values For Impurity Constituents**

Moisture	2.94	B	0.0051*
S	0.80	Fe	0.311
Si	0.17*	Ni	0.0029
Ti	0.019	Na	0.459
Ca	0.62	Mo	0.069
V	0.066*	Mg	0.229
As	0.035	K	0.11*
Zr	0.044*	P	0.030*

\* provisionally recommended

**Legal Notice**

The Canadian Certified Reference Materials Project (CCRMP) has prepared this reference material and evaluated the analytical data of the interlaboratory certification program to the



Natural Resources Canada  
Ressources naturelles Canada



best of its ability. The Purchaser, by receipt hereof, releases and indemnifies CCRMP from and against all liability and costs arising out of the use of this material and information.

**Reference**

The preparation and certification procedures used for CUP-2 are described in CANMET Report CCRMP 88-3E, "CUP-2: A Certified Uranium Ore Concentrate", which is available at no charge on request to:

Coordinator, CCRMP  
CANMET, (EMR)  
555 Booth Street  
Ottawa, Ontario  
K1A 0G1  
Canada  
Telephone: (613)995-4738  
Telefax: (613)996-9673  
Telex: 053-3395

*Pour obtenir la version française du présent certificat d'analyse, prière de s'adresser au Coordonnateur du PCMRC*

### **Attachment E: Update on the Status of the Nuclear Security Training Center at INP**

The U.S. DOE/NNSA and Defense Threat Reduction Agency have been working with Kazakhstan to erect a Nuclear Security Training Center (NSTC) at INP. The Center's objective is to improve indigenous nuclear security and safeguards training capabilities for all nuclear facilities in Kazakhstan (Fig. 2). The audience for this training center will include plant personnel (INP, Ulba Metallurgical Plant, Mayak, etc...), regulator and other government officials, as well as law enforcement officials. INP indicated they intend to develop training in nuclear forensics as well. Although the initial goal is to focus on domestic stakeholders, INP intends to develop the NSTC into a regional training center, and intends to solicit participants and instructors from both Kazakhstan and abroad. The United States interagency is collaborating with Kazakhstan to develop curricula for countering nuclear smuggling and other nuclear security issues at NSTC.

The site of the NSTC consists of two buildings. One building will contain radiation detection monitors (portals, handheld equipment, etc.), while the second building will contain classrooms and other training facilities (divided over three floors including basement). The NSTC will have different types of radiological sources and nuclear material for use in training courses. P. Chakrov (INP) indicated that INP has also reserved some land adjacent to the training center for future construction of guest housing; this is currently on hold due to budgetary limitations. Construction of the NSTC is expected to be completed by the end of 2016.



**Fig. 4:** Dep. Director Petr Chakrov (center) showing the ongoing construction of the Nuclear Security Training Center (NSTC) on INP grounds.